

BIRD-WATCHING
AND
BIRD BEHAVIOUR

By the same Author

ESSAYS OF A BIOLOGIST
ESSAYS IN POPULAR SCIENCE
ANTS etc

BIRD-WATCHING AND BIRD BEHAVIOUR

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THESE FEW PAGES ARE GRATEFULLY
DEDICATED TO MY
WIRELESS LISTENERS

AUTHOR'S NOTE

THE following pages are a transcription of six wireless talks which the British Broadcasting Corporation asked me to give this spring. The numerous letters which I received from my listeners showed the interest of the general public in the subject, and encouraged me to publish the talks, slight though they be, in a more permanent form.

I have made only a few verbal alterations in the manuscript, preferring to send this little book out in all its incompleteness as a mere *aperitif*—a brief mouthful for actual bird-lovers, and perhaps a stimulus and opener of eyes for potential ones—rather than alter its character by any attempt at documentation or fullness. I have, however, appended a brief list of books which will serve as further introduction to the subject. I owe much to other bird-watchers; the names I have cited in the text indicate some of my chief indebtednesses.

I may perhaps say that in answer to a specific request I made over the ether for more information concerning the crocus-attracting propensities of sparrows (p. 56), I received over a hundred

AUTHOR'S NOTE

letters. Although the facts they gave did not actually solve the problem, they took it a stage further, and were of considerable interest, not only in themselves, but because they seemed to show the opportunity of doing co-operative natural history research of real value over the wireless.

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CONTENTS

	PAGE
AUTHOR'S NOTE	vii
I. THE PLEASURES OF BIRD-WATCHING	I
II. MEMORABLE INCIDENTS WITH BIRDS	23
III. THE EVERYDAY LIFE OF BIRDS	41
IV. WATCHING THE COURTSHIP OF BIRDS	59
V. THE MIND OF BIRDS	81
VI. THE BIRDS' PLACE IN NATURE	99

ILLUSTRATIONS

FIG.

- I. The Charm of Birds. A Little White Egret, photographed from a canoe in Mr. E. A. McIlhenny's Egret Sanctuary at Avery Island, Louisiana. (Photograph by J. S. Huxley.) *Frontispiece*
- II. A Young Sapsucker looking out of his nest-hole an hour or so before taking his first^a flight. (Photograph by J. S. Huxley.) *To face p. 32*
- III. A Few of the Hundreds of Thousands of Rosy Flamingoes on Lake Nakuru, Kenya Colony. (Photograph by Carveth Wells.) *To face p. 36*
- IV. Courtship in the Adelie Penguin: the "Ecstatic Attitude." The female is to the right, sitting in her stone-rimmed nest. (Photograph by Dr. Murray Levick.) *To face p. 62*
- V. The Association of Nest-material with Courtship. A male Louisiana Heron offering a twig to his mate, who has just relieved him on the eggs. Both birds have assumed a special excited attitude seen only in courtship. (Photograph by J. S. Huxley.) *To face p. 66*
- VI. A Crested Grebe on the Nest. In the breeding season both sexes grow the elaborate ruff and ear-tufts and use them in courtship-display. (Photograph by G. C. S. Ingram, Cardiff.) *To face p. 72*

BIRD-WATCHING AND BIRD BEHAVIOUR

FIG.

- VII. A Wonderful Product of Bird Instinct. Weaver-bird nests in Kenya Colony. To reach the eggs, the bird must enter a tube whose opening faces downwards (seen at the left on the lowest and the right-hand nests). On the left a male bird is seen hovering at the entrance of his nest. (Photograph by J. S. Huxley.) *To face p. 84*
- VIII. A Perversion of Instinct. A Black-headed Gull contentedly brooding a tobacco-tin which has been substituted for its eggs. (Photograph by F. B. Kirkman.) *To face p. 88*

I
THE PLEASURES OF BIRD.
WATCHING

THE PLEASURES OF BIRD-WATCHING

WHEN it was arranged that I should give these talks about birds, I put *bird-watching* into the title of the series, as this, more than any other single word I could think of, would tell my potential listeners the lines along which I meant to approach my subject. For you can deal with birds in a great variety of ways. You can treat of them as egg-laying machines, or objects for the pot; as an agreeable but vague part of the general background of life in the country; as potential allies or enemies of man in his job of growing crops and trees; as objects of all the varied kinds of scientific study— the study of their structure, their physiology, the aerodynamics of their flight, their evolution, distribution, migration; as things to keep in parks or cages; as lay figures to be dressed up by sentimental imagination, or turned into 'popular natural history'; or as creatures to provide sport by being shot at.

About one or two of these ways of treating birds, and their results, I shall have something

THE PLEASURES OF BIRD-WATCHING

to say later ; but the attitude from which I shall start and which I shall keep by me throughout is the attitude of the bird-watcher. For him birds are living creatures which interest him for no ulterior reasons, but just because they are birds ; which he likes to watch for the sake of the watching ; which attract him and give him pleasure in their own right.

There are all degrees of enthusiasm among bird-watchers as among scientists or sportsmen, but to the more ardent, bird-watching will have been, at some period in their lives, the very breath of their nostrils. They will have spent their spare time and their holidays at it, rushing off to this or that famous haunt of bird-life, or simply wandering through woods and by rivers, day after day, with their field-glasses ready in their hands, waiting for what, in the way of birds, may turn up for them to look at.

One of the bird-watcher's most obvious rewards is that the countryside soon becomes alive to him in a new way. Every kind of bird has its own particular quality or character, so to speak, which derives partly from its size and colouring and voice, partly from its temperament and habits, partly from the surroundings where one is accustomed to see it.

THE PLEASURES OF BIRD-WATCHING

To go out on a country walk and see and hear different kinds of wild birds is thus to the bird-watcher rather like running across a number of familiar neighbours, local characters, or old acquaintances. The walk becomes a series of personal encounters instead of a mere walk. A correspondent sends me the following quotation (whose author I have been unable to discover) which beautifully sums up what I mean: 'He whose ear is untaught to enjoy the harmonious discord of the birds, travels alone when he might have company.'

The difference is, of course, that each bird which makes its impression on us as would a single human personality is really a whole species, all of whose individuals we lump together. The qualities we recognize are those of kinds of birds, not of single birds. This natural reaction makes one neglect the separate bird individuals, and think of the species as if it were really a single creature. Keats did this in his *Ode to a Nightingale* when he wrote:

Thou wast not born for death, immortal bird:
No hungry generations tread thee down,

and other poets have expressed the same idea.

THE PLEASURES OF BIRD-WATCHING

But at least it makes of each kind of bird a single and perennial friend.

An appreciable part of the feelings which you have for a countryside will, if you are a bird-watcher, be derived from its birds. An American landscape may now and again look surprisingly like an English one; but its birds will speedily remind you of its alien character. The blue-jays and American robins, thrushes and cat-birds, chipping sparrows and vireos—what a different quality they give from our English blackbirds and rooks, thrushes, redbreasts and wagtails, chaffinches and whitethroats.

The bird-watcher by his knowledge of birds' notes may come by experiences from which others are debarred. One early morning towards the close of last year, I was lying in bed, just awake, on the shores of the Victoria Nyanza, close on the equator in Central Africa. From my window, I could see the fronds of a tall palm-tree. At its foot, though the season was December, there were bright flower-beds and green lawns; and beyond there was a park-like stretch of grass, dotted with magnificent trees all in leaf, sloping down to the soft blue waters of the lake under the bright sun. Suddenly a song came from just outside the window—the song of a willow wren, a willow

THE PLEASURES OF BIRD-WATCHING

wren on migration three or four thousand miles from the place where it was hatched; and automatically, as I heard the fresh and delicate dying fall of the notes, they brought back to me all the other attributes and associations which give the willow wren its particular character—the slender, modest, green-brown body of the singer, the cool of an English spring, a piece of rough furzeland, with the leaves barely unfolded on the birch-trees, the bird prying about for the few early insects. The willow wren is the antithesis of all that is tropical, an embodiment of freshness, delicacy and northern springtime; it was strange and even moving to hear it thus in the heart of Africa.

In the same sort of way the yellow-hammer's song seems the best possible expression of hot country roads in July, the turtle-dove's crooning of midsummer afternoons, the redshank's call of sea-breeze over saltings and tidal mudflats, the robin's song of peaceful autumnal melancholy as the leaves fall in a sun which has lost its warming power.

The bird-watcher watches because he loves watching, because birds are good to look at, because their characters and doings interest him. He is filled with a desire to see more of their lives. At the outset, at least, he will have no

THE PLEASURES OF BIRD-WATCHING

ulterior motive. He will not want to classify or compare his facts, to turn his watching into scientific study or to discover support for some pet theory; what he sees will be itself a sufficient reward. The late W. H. Hudson and Edmund Selous, who I am glad to say is still among us and still occupied with birds, are two of the most indefatigable bird-watchers—as distinct from ornithologists—whom the world has had in recent times. I have transcribed an extract from the writings of each, to give a notion of the strange unexpected sights and glimpses of vivid intimacy with Nature which the bird-watcher may witness and record for us.

First the passage from Hudson. It concerns a South American bird, the ypecaha, a kind of rail. Rails are usually skulking birds, and most people count themselves lucky simply to get a clear view of one. But Hudson managed to find out that they indulged in extraordinary social dances and what we may call screaming parties, to unravel whose full meaning must be the aim of bird-watchers yet to come.

“A number of ypecahas have their assembling place on a small area of smooth, level ground, just above the water, and hemmed in by dense

THE PLEASURES OF BIRD-WATCHING

rush-beds. First, one bird among the rushes emits a powerful cry, thrice repeated; and this is a note of invitation, quickly responded to by other birds from all sides as they hurriedly repair to the usual place. In a few moments they appear, to the number of a dozen or twenty, bursting from the rushes and running into the open space, and instantly beginning the performance. This is a tremendous screaming concert. The screams they utter have a certain resemblance to the human voice, exerted to its utmost pitch and expressive of extreme terror, frenzy, and despair. A long piercing shriek, astonishing for its vehemence and power, is succeeded by a lower note, as if in the first the creature had wellnigh exhausted itself: this double scream is repeated several times, and followed by other sounds, resembling, as they rise and fall, half-smothered cries of pain and moans of anguish. Suddenly the unearthly shrieks are renewed in all their power. While screaming the birds rush from side to side, as if possessed with madness, the wings spread and vibrating, the long beak wide open and raised vertically. This exhibition lasts three or four minutes, after which the assembly peacefully breaks up."

THE PLEASURES OF BIRD-WATCHING

Selous has only had the chance of concerning himself with the more familiar birds of our own corner of the north temperate zone, but he has watched many of their secrets out of them, as witness this passage about the life of guillemots, those commonest of northern diving sea-birds:

“Nothing is more interesting than to look down from the summit of some precipice on to a ledge at no great distance below, which is crowded with guillemots. . . . Much affection is shown between the paired birds. One that is sitting either on her egg or young one . . . will often be very much cosseted by the partner who stands close behind or beside her. With the tip of his long, pointed beak he, as it were, nibbles the feathers . . . of her head, neck, and throat, whilst she, with her eyes half closed, and an expression as of submitting to an enjoyment—a ‘Well, I suppose I must’ look—bends her head backwards, or screws it round sideways towards him, occasionally nibbling with her bill, also, amidst the feathers of his throat, or the thick white plumage of his breast. . . .

Married birds sometimes behave in a pretty

THE PLEASURES OF BIRD-WATCHING

manner with the fish that they bring to each other, and if coquetry be not the right word to apply to it, I know of none better. The following is my note made at the time:

‘A bird flies in with a fine sand-eel in his bill, and having run the gauntlet of the whole ledge with it, at last succeeds in bringing it to his partner. For a long time now, these two coquet together with the fish. The one that has brought it keeps biting and nibbling at it, moving his head about with it from side to side, bringing it down upon the ledge between his feet, then raising it again, seeming to rejoice in the having it. The other one seems all the while to admire it too, and often makes as though to take it from him—prettily and softly—but he refuses it to her, something as a dog prettily refuses to give up a stick to his master. At last, however, he lets her take it . . . and when she has it she behaves in much the same manner with it, whilst he would seem to beg it back of her, and thus they go on together for such a time that at last I weary of watching them. . . . It is quite apparent that the fish is only something for coquetry and affection to gather about. . . . Yet the birds—and this is what I constantly notice—seem only to have a kind of half-consciousness of what they mean. . . .’

THE PLEASURES OF BIRD-WATCHING

Yet there are harsher notes amidst all this tenderness, and the state of a bird's appetite will sometimes make a vast difference in its conduct under the same or similar circumstances. A bird, for instance, that has just come with a fish in its bill for the young one, is violently attacked—and this several times in succession—by the other parent, who is in actual charge of the chick. This one—we will suppose it to be the father, though I half think, unjustly—makes the greediest dart at the fish, trying to seize it out of his wife's bill, and also pecks her very violently. Once he seizes her by the neck and holds her thus for some seconds, yet all the while in the couched attitude and with the chick underneath him. The poor mother yields each time to the storm, scuttles out of the way, seems perplexed and startled, but keeps firm hold of the fish. Driven away over and over again, she always comes back, by dint of perseverance and right feeling weathers the storm, insinuates herself into the place of the greedy bird and begins to feed the chick. A new chord of feeling is now struck and the bird that has been so greedy and ill-tempered co-operates in the most tender and interested manner with the wife whom he has outraged."

THE PLEASURES OF BIRD-WATCHING

I have said that the bird-watcher need by no means be an ornithologist also; but from the two extracts I have just given, it is clear enough that he can be an ornithologist if he chooses. For what he is after is *experiences with birds*, to use the title of one of Hudson's own books; and to satisfy him, they must be experiences objectively and accurately observed, not fantasies spun out of his own head, or emotions which happen to have been touched off by the sight or sound of some bird. It is the facts of bird-life which he is impelled to watch—and very often, luckily for others, impelled to record as well.

From the bird-watcher pure and simple it is but a step to the bird-watcher naturalist. The only difference is that, to merit the name of naturalist, a man must concern himself pretty thoroughly and systematically with nature, and not be content with occasional and dilettante satisfactions; and he must be in the habit of asking himself questions about what he sees, and trying to find out the answers.

From bird-watcher naturalist to bird-watcher ornithologist is again not a big step: to take it, a man must introduce scientific ideas and scientific methods into watching and its aims and results. Besides mere general watching for its

THE PLEASURES OF BIRD-WATCHING

own sake, he must have some theory or idea in mind which he wants to test, or some particular subject on which he feels that he needs more knowledge before he can understand it; and in his watching must then set himself systematically to collect facts bearing on this theory or this subject.

In making observations he must be critical and accurate, must try and make sure that he is not being lazy and interpreting them in accordance with his preconceptions, not being biased and unconsciously twisting them to make them mean what, he would like them to mean; he must be sure not only to make a detailed record of what he sees, but to make it on the spot and at the time, or as soon after as humanly possible. He must make himself acquainted with what others have written on the same subject, not merely by casual reading, but by systematically going through the possible sources of information in some good library. He must take the trouble to publish not merely his conclusions but his observations, so that others may be able to read them. It is often forgotten that this too is an essential part of that system of pursuing knowledge which we call science—the publication of evidence as well as conclusions, so that even if

THE PLEASURES OF BIRD-WATCHING

your own ideas are wrong, someone else can still use your facts, perhaps with their help coming to diametrically opposite conclusions.

In setting forth his facts he must not put them down, higgledy-piggledy, but must take the trouble to sort them out and present them in some orderly arrangement which helps the reader. And in drawing his conclusions he must use all his resources of comparison, scientific imagination (which, by the way, is not so different from other kinds of imagination as most people seem to suppose) and of logic.

Bird-watching can in fact be an end in itself; but its results are indispensable material for science. They are specially valuable, perhaps, for two branches of science—the study of the behaviour and mind of animals, of which I shall speak in a later talk, and the study of the relations of living things with each other and with their environment, which we generally call ecology, though it might as well be called scientific natural history. This latter branch of biology is destined to play a large practical part in human affairs. We have now learnt by bitter experience that it is not enough to find out that a particular disease is caused by this animal, a particular plague of

THE PLEASURES OF BIRD-WATCHING

our crops is due to that one; and that it is not safe to introduce a new animal or plant into a country just because in another country it is agreeable or useful. The introduced species may in its new home turn into a pest, like the house sparrows imported into New Zealand by homesick English Colonists who thought they would like to hear their chirping, or the thistles brought to California by a too-patriotic Scotchman. And attempts to exterminate the pest or the disease-spreader by direct and obvious methods almost always break down. In all cases we must know precisely how the creatures live, with what other lives they are linked in Nature's endless round of eating or being eaten, to what ups and downs of reproductive energy they are subject. And in this field, where we never know what fact may turn out to be our clue, the watcher and the naturalist will often make quite as important contributions as the man of science and the experimenter. Mr. Elton, in his recent book on *Animal Ecology*, says that on many points, after drawing blank among the usual sources of scientific information, he was able to get what he wanted from gamekeepers, trappers, shepherds, fishermen, amateur naturalists and country folk generally—people whose business or pleasure it

THE PLEASURES OF BIRD-WATCHING

is to observe Nature's happenings accurately and note them in their own minds.

Indeed it is very frequently the case that the good bird-watcher becomes a good naturalist; it happens almost by a natural momentum, provided he has enough time and energy to spend on his hobby. For him to become also a good scientist is rarer, largely because the whole apparatus of scientific research is so elaborate, and it all takes so much time and so much digging among books as well as so much making and verifying of observations; but there have been plenty of examples.

However, my purpose in these talks is not to extol natural history or biological science, but the more immediate satisfactions of bird-watching. And in what I have just been saying I have only been concerned to show that this pursuit can easily lead on to something more, and that the observations of bird-watchers can be of real value to science and so in their small way help towards our understanding of the universe and our own place in it.

Before ending I would like to give an example of my own—one of the sights which has given me most pleasure in my own watching of birds. I will quote from an account I wrote a number

THE PLEASURES OF BIRD-WATCHING

of years back, of the thousands of herons and egrets which congregate to breed each spring in the ponds in Avery Island, among the palmettos and semi-tropical coast-marshes of Louisiana ponds which Mr. McIlhenny, the owner of the place, constructed, and in which he founded the beginning of the huge mating colony of to-day by bringing up half a dozen egret nestlings there by hand.

"The most impressive sight at the rookery is the return of the birds at evening. Their bird-city is the inverse of our cities; the birds make their homes in dense aggregations, but scatter afield for their daily bread. Only the nests and roosting places are in the pond; food must be found in pools upon the salt marshes, five, ten, fifteen miles away or even further. There all the birds return in the hour before sunset. Troops of them can be seen converging from different quarters. They come singly (though this is rare), or in isolated groups of two or three, or in bigger flocks of ten or twenty or thirty. With wing-beats as uniform and steady as the beats of a pendulum they drive onwards towards the rookery, the curved wings arched downward, like those of our own heron, at every stroke. The quiet and regular convergence of these bands along the airways at

THE PLEASURES OF BIRD-WATCHING

a level of two or three hundred feet up has the impressiveness of an army's assembling.

'Once arrived above the pond, however, all is changed. The birds drop down to their nests, and in the plunge abandon themselves to the wildest enjoyment of aerial motion. A few, to be sure, *volplane* slowly down in spirals, with spread, tilted wings; but the majority simply fold their wings and drop through the air. The scapulars stream upwards in the rush; the filmy *aigrettes* are like blown lace, while the long ribbony plumes of the little blue herons, like quivering streamers in a gale, give a comet-like impression of speed. When the falling creatures are within twenty or thirty feet of the tree-tops, the wings are partially spread, directed forwards and downwards to act as a brake. As a result of this check and change of direction on the speed of the fall, the birds swerve and swoop from side to side in the most extraordinary curves of violent yet graceful motion, side-slipping, plunging in broadening spirals, rising in airy switchbacks and hanging poised to fall again, the twenty members of a band plunging and intercrossing in all directions, marvellously avoiding collision, and filling the air with cries.

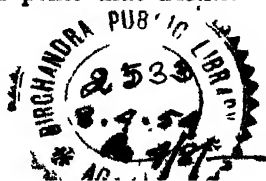
'The appearance of the motion is difficult to

THE PLEASURES OF BIRD-WATCHING

describe, but at least the reason for the performance is not far to seek. It is sheer pleasure in motion and its control—play, or sport, if you will, but in any case the same pleasure which we ourselves find in diving, or tobogganing, or skiing, or motoring. Many kinds of birds thus play tricks in the air for the mere pleasure of playing them. Rooks will fall through the air in just the same way, only from a much greater height; I have seen our own English heron, for all its size and apparent stolidity, go through the most extraordinary series of somersaults from four to five hundred feet up; ravens over and over again will turn three parts on their backs and glide.”

In this sight all the pleasures of bird-watching were combined. There was abundance of sheer beauty; there was the fascination of witnessing an unusual scene; there was the scientific interest of getting a glimpse into the mind of birds by seeing what they did to amuse themselves in sport.

Such experiences do not come every day. But the charm of bird-watching is that the most familiar birds and the most humdrum surroundings may provide incidents to interest you, sights for you to remember. A year or so back, one of our ornithologists asserted in print that British



THE PLEASURES OF BIRD-WATCHING

ornithology was now 'played out,' and that accordingly Britons interested in the subject would perforce have to go further afield to pursue their favourite science. Even if this astonishing statement had been even approximately true, it would not mean that there were no pleasures left for the bird-watcher at home. Each of us has to make the old discoveries anew—of the different kinds of birds, their beauties and their ways, how to tell them by their songs and call-notes and flight, where they breed and all about their habits. And further, since neither individual birds nor their circumstances are cast in a fixed mould, there will always be plenty of variety in the particular incidents of particular birds' lives.

But the statement was very far from the truth. It is true that we now know pretty accurately the kinds of birds which are to be found in this country, where they nest, what their eggs look like and how many they lay, the geographical distribution of each species and variety, and so forth. Even here, however, there are missing facts to be filled in. And elsewhere there are the most surprising gaps. Is it not surprising, for instance, to find that in quite a number of our regular breeding birds we still do not know the

THE PLEASURES OF BIRD-WATCHING

length of time from hatching to leaving the nest?—yet so it is. And when we come to habits and behaviour—the special field of most bird-watchers—the gaps are still bigger and more surprising.

The truth is, as we have been shown by books like Mr. Eliot Howard's or Mr. E. M. Nicholson's, that we are not in possession of even a moderately full knowledge of the actions and detailed way of life of any but quite a few kinds of British birds. So that the bird-watcher has plenty of opportunities of adding to the sum of knowledge as well as of enjoying himself. Bird-watching as a pursuit, in fact, is entertaining, healthy, and interesting. In my succeeding chapters I propose to try and justify this statement.

II
MEMORABLE INCIDENTS
WITH BIRDS

II

MEMORABLE INCIDENTS WITH BIRDS

IN my first Chapter I set out to explain why some people were so passionately addicted to the watching of birds. Here I shall try to justify the bird-watcher still further by telling of some of his special rewards, in the shape of the notable scenes and memorable moments which come to him now and again, as happy accident or a result of his devotion. And as first-hand is always better than second-hand, I shall speak of my own experiences.

I had been fond of birds since a child ; but it was when I was about fourteen that I became a real bird-watcher. The incident which precipitated the change was this. One morning of late winter, crossing the laundry-yard of my aunt's country house, I saw a green woodpecker on the grass only a few yards from me : I had just time to take in the sight of it before the bird was off to the wood beyond the hedge. The green woodpecker is a common bird enough ; but I had never seen one close. Here

MEMORABLE INCIDENTS WITH BIRDS

I saw every striking detail: the rich green of the wings, the flash of bright yellow on the back when he flew, the pale glittering eye, the scarlet nape, the strange moustache of black and red; and the effect was as if I had seen a bird of paradise, even a phoenix. I was thrilled with the sudden realization that here, under my nose, in the familiar woods and fields, lived strange and beautiful creatures of whose strangeness and beauty I had been lamentably unaware.

Most bird-watchers, I should imagine, are started off on their hobby by some such sudden glory. The next step in their career is generally the same new realization of beauty and strangeness in other common birds; and only then, as familiarity dulls the edge of novelty, do they turn to look for rarities to give them new excitement.

That certainly was the course of events with me. I can recall to-day with extreme vividness the pleasure of discovering the detailed loveliness of a cock bullfinch busy on a fruit-tree—glossy black of head, soft but vivid brick-red of breast, delicate white of rump, exquisite bluish grey of back—or watching for the first time the mottled brown creeper mousily climbing a tree and prying into the crevices with its long curved

MEMORABLE INCIDENTS WITH BIRDS

beak, and realizing that here was a new kind of existence which I had not previously suspected.

In the same way I remember feasting my eyes on the astounding beauty of the plumage of teal on seeing a flock of these on a pond in Surrey; and being spellbound by the fantastic ventriloquial note of the grasshopper warbler the first spring I heard it.

A year later I can recall with equal vividness the excitement of coming over the crest of a heathery common (not forty miles from London) and seeing an enormous bird of prey get up fifteen or twenty yards away, leaving half a pheasant carcase on the ground; and of discovering that this was no less a personage among birds than a young white-tailed eagle. That was my first experience of a thrill of rarity; and it set me off deliberately trying to collect glimpses of rare birds as the philatelist collects rare postage stamps. I could take a map and mark down just where I saw my first dartford warbler, my first smew, Montagu's harrier, and so on.

Then, of course, there is the fascination of making little discoveries for oneself. I well remember how, after much watching, I found out that a certain often-heard song was produced by the lesser whitethroat, and the earlier moment

MEMORABLE INCIDENTS WITH BIRDS

when I first learnt to tell the missel-thrush's song from the blackbird's. Every bird-watcher has to make these discoveries; they have all been made before, but, none the less, when he makes them for himself, he experiences the same sort of feeling that must have been Gilbert White's when his careful observations discovered the difference between the various common warblers.

Later still, new rarities become less frequent, and on the whole less interesting. The rewards of the bird-lover in this stage are new insights into the lives of familiar birds, new glimpses of their beauties and capabilities. One April day in Surrey, for instance, from an old stone bridge over the river Wey, I saw an unaccustomed number of little birds in the bushes. Exploration revealed that these were warblers of many different kinds, and that the banks and bushes for a couple of hundred yards were crowded with them, feeding, or talking softly to each other between whiles. They were a band of migrants, working their way up the guiding highway provided by the river, their subdued manner telling of the fatigues of their previous journey. They brought home the realities of migration more forcibly than could have a band of swallows in flight; the contrast between their quiet, tired

MEMORABLE INCIDENTS WITH BIRDS

little company in the English landscape and the thought of the thousands of miles they had come was overwhelming.

For revelation of the beauty of flight, I commend a scene once witnessed in North Wales. I was high up on the mountains above Ogwen. A buzzard was mewing overhead. I looked up, and saw it circling upward, very high, a mere speck over the crags of the Glyders. Suddenly it set its wings at an angle and started to glide steeply down. Without once changing direction or speed, it kept its invisible track until it disappeared far to westward behind a distant ridge against the late afternoon sky. In one act of flight it had traversed half Snowdonia. No other creature in the world but a large bird could achieve anything like this speed or singleness of sweeping motion.

Many of the bird-watcher's rewards come like this one, unexpectedly. Here is another piece of intimacy with which I was thus rewarded gratis just for being on the spot and taking the trouble to look (which I admit some people wouldn't have done). About five months ago I was standing by the side of a road in the Belgian Congo in the quick-falling equatorial twilight, the lorry on which we were supposed to be travelling

MEMORABLE INCIDENTS WITH BIRDS

having stuck in the mud for the fourth or fifth time. Just ahead I saw shapes fluttering against the sky; they turned out to be nightjars, thirty or forty of them, sweeping round and back over one spot with quick, swift-turning flight, ghostly because so absolutely noiseless, but beautiful in their grace and controlled motion. I slipped down over the bank to be nearer, and then suddenly realized why they were there. A big white ants' nest stood on the slope and from it were issuing hundreds upon hundreds of the winged king and queen termites for the one sortie of their lives, the nuptial flight. The nightjars had discovered this, and as the termites fluttered up looking rather like caddis-flies (I could just see their long winged shapes against the twilight sky), the birds swooped at them, with their huge mouths opened wide. This social but silent meal, taken on the wing, with twistings and turnings and every subtlety of flight, this banquet for the birds which for the white ants was a massacre of all their emigrants and potential founders of new colonies—the whole scene, though I watched for only five minutes, gave a sudden insight into the strange details of the birds' life, a sense of unexpected intimacy, such as comes in some foreign country through a glimpse of a family seen at

MEMORABLE INCIDENTS WITH BIRDS

their lamp-lit evening meal through a window left uncurtained.

But it is not only the unexpected that is memorable. One may be rewarded for deliberate search or patient watching. On the Oxford University Expedition to Spitsbergen, three of us set out one day to visit one of the celebrated bird-cliffs of the Arctic. The vast numbers of sea-birds which come north to the Arctic to breed must find security for their nests from marauding foxes; and most species take advantage of ledges on precipitous cliffs. As such cliffs are few and far between, they are crowded in an astounding way.

It was a long way from camp to the birds—hours across snowy, soggy tundra to where a heavy ship's boat had been left a day or so before, and then hours more in the boat. Our goal was the cliff-bastion at the north end of Prince Charles's Foreland—a narrow prow of rock, each side of it more than a mile long, and two thousand feet high. When we were still nearly two miles away, we began to hear the birds; and by the time we were half a mile off, the noise was like the parrot-house at the Zoo heard from just outside. The chattering and screaming of the hundreds of thousands of birds blended into one continuous high-pitched roar. Though it was

MEMORABLE INCIDENTS WITH BIRDS

11 p.m. when we at last reached the foot of the cliff, the midnight sun made bright daylight, and there was no abatement of the birds' activity. Innumerable kittiwakes, guillemots, and razor-bills, with a sprinkling of puffins, crowded the cliff-face, and, near the top, colonies of the huge and predaceous glaucous gulls, the robber barons of the Arctic bird-world. Against this background of deafening noise, hundreds of tiny winged specks whirred into the high ledges with food, whirred out again to fish for more. It was an amazing concentration of vital activity.

I found it an effort of imagination to recall to mind that this bird-city was but a seasonal affair, and that in the winter the bird-cliff was wholly untenanted, the rich supplies of food that team in the Arctic seas made unavailable by a crust of ice. But the efficiency with which the birds exploit the riches of the sea was vividly brought home by a simple concrete fact. Spitsbergen boasts no trees or even bushes; and over most of it the prevailing grass and lichens are low, the few flowering plants nestling in crevices or growing in the form of dense cushions. All round the bird-cliff, however, where plants were nourished by the birds' droppings, the grass was tall, the weeds were lush and rank, growing a

MEMORABLE INCIDENTS WITH BIRDS

couple of feet high instead of two or three inches, so that the whole complexion of the surroundings was changed.

We had twelve miles still to do, two of us, in the slow heavy boat; and had been out already for fifteen hours. So I lay down on the grass, and, though less than seven hundred miles from the Pole, was able to rest the better part of an hour in perfect comfort, so windless and balmy was the air, tempered by the midnight sun. The birds' clamour filled the place; their forms shot to and fro at every level, up to nearly half a mile above my head, hundreds every minute. It was a complete revelation of the abundance of Nature and her unconcern with man on this Arctic uninhabited island.

That was a reward on the grand scale. Now for one whose interest was individual. Up in the Bighorn Mountains of Wyoming, in one of the rich grassy valleys lying above the dry and canyon-riven slopes that stretch down to the barren Badlands three thousand feet below, I once spent a week in camp. Our camp was among a grove of magnificent aspens, close by a clear mountain river full of trout; and in one of the aspens a pair of sapsuckers had made their nest. Sapsuckers are a kind of woodpecker,

MEMORABLE INCIDENTS WITH BIRDS

and like other woodpeckers they excavate their nests in the solid wood of tree-trunks and limbs.

The young were well grown, and sometimes used to climb up and peep out of the nest-hole to see if their parents were coming with food. I rigged up a camera in the tree with a string attached to the shutter, and got one or two photographs of both old and young birds. One morning as I sat there watching and making notes, one of the young birds came to the entrance, pushed his body further out than he had ever done before, and set up a fearful shrill chirping. I wondered what was the matter; and then, at the end of a couple of minutes, he suddenly precipitated himself out of the nest, spread his wings, and waveringly, but quite adequately, made his way through the air to alight on the trunk of a neighbouring tree. What he had been excited about (and not at all unnaturally) was that he had been plucking up courage to launch himself on his very first flight. He never returned to the nest.

The sight made a strong impression on me. To be able to throw oneself into the air like that, absolutely untaught, absolutely unpractised, and fly from the word go! For the air, be it remembered, has the same laws for living birds

MEMORABLE INCIDENTS WITH BIRDS

as for artificial aeroplanes: the forces of nature are not kinder to birds than to us because they are a part of Nature and we are half outside, as it were, trying to subdue nature artificially. Birds, like aeroplanes, have to have their minimum flying speed and lateral stability and all the rest of it; they must be able to bank, to steer both sideways and up-and-down; they must be protected against side-slipping and nose-diving; they are liable to be caught in bumps and eddies and air-pockets. And yet the astoundingly complicated machinery—motor, wings, steering-gear and controls—is all provided within a month or so from their first beginnings of development within the egg, ready-made and ready-to-use.

I was impressed at the time; looking back now, I am still more impressed, as in the meanwhile there have been published the accounts of a number of extremely interesting experiments, notably by Professor Magnus of Utrecht, which show that the regulations of posture, attitude and limb-position which constitute the birds' steering-controls are all automatic, depending on an incredibly complicated arrangement of nerve-fibres and nerve-connections in the lower centres of the brain. The part of the bird's brain which is conscious and capable of learning and of

MEMORABLE INCIDENTS WITH BIRDS

improving things by practice only puts a polish on what the unconscious automatic part can do without thinking and without practice. What a stupendous machinery to be built up by the blind forces of evolution and heredity!

There are dozens of other impressions which I would have liked to try to convey to you—the impression of rosy flamingoes standing round an African lake in such myriads that you could see the pink of them as a strip along the margin from ten miles away; of my first sight of the rock-creeper climbing up a vertical rock-face in the Alps, and with each upward movement, jerking his wings half open to show a proud patch of crimson and black, in wonderful contrast with the sober grey-brown of the rest of his plumage and his grim surroundings: of little white egrets among the green bowers of Louisiana swamps ceremoniously relieving one another of the duties of incubation in a burst of excited sound and a filmy white cloud of raised and outspread aigrette plumes: or of a sight I saw one clear winter's day at St. Andrews—a large flock of those handsome little shorebirds, the knots, so common in winter on our coasts, whose eggs yet eluded discovery until the present century—this cloud of many thousand birds was

MEMORABLE INCIDENTS WITH BIRDS

manœuvring as one, showing now all the white bellies, now all the dark backs, now making an opaque blur against the Grampian Mountains in the distance, now like a venetian blind letting the blue landscape show through.

But my space is running to an end, and I must close with but one more incident. I will choose one with all the qualities that make bird-watching so delightful : it was unexpected, it was interesting, it was lovely ; and in addition there remains something of a mystery about it.

I was staying for Whitsun one year at a little inn on the Upper Thames. Under the eaves a number of house-martins were building their mud nests. I was interested to find out something of their courtship, but there had been no courting in evidence during the Saturday afternoon and evening. So, knowing that such activities are often most pronounced in the early morning, I got up before dawn on the Sunday. To my surprise, there were no martins to be seen—none in or by their nests, none flying round. I walked round the place, and up and down the towpath, along which spread a faint mist from the river, and still saw nothing of my birds. Then from the barn came a single swallow, and flew steeply up into the sky. I followed its flight with my

MEMORABLE INCIDENTS WITH BIRDS

eyes, and suddenly saw why I had failed to find the martins. They were all up there in the blue, circling round in company with some barn-swallows and chimney-swifts, from which I could just distinguish them at the height they were flying. The sun had not yet risen where I stood on the solid earth; but he already reached the birds high above my head. And as the earth spun and the sun's rays approached its surface, the birds sank with them, twittering all the time; until finally the light struck the inn and flooded the meadows, and the birds dispersed to the duties of the day.

There can be little doubt that when I first came out, half an hour before I saw the birds, they had already flown up to greet the sun and make themselves a longer day; but how far above the earth they flew before they reached the light and began to circle in it and sink with it, I do not know. Nor do I know if martins and swallows and swifts do this regularly. I have not had the opportunity of setting myself to find out, and although I published a little account of the incident at the time, and asked for more information about such sun-greeting habits, none was sent me. It may be that the birds only ascend thus on radiantly fine mornings; or only during

MEMORABLE INCIDENTS WITH BIRDS

a short space of the early breeding-season; or that it is a local habit of Oxfordshire birds. That remains to be discovered. All that I know is that on this particular day I saw the birds anticipate the dawn; and that the sight is still something to be remembered.

III
THE EVERYDAY LIFE
OF BIRDS

III

THE EVERYDAY LIFE OF BIRDS

THE routine of birds' lives we are a little apt to take for granted. They feed, sleep, make love, disport themselves in song and play, rest, look after their young; they grow, age, and die; their life, in fact, more or less mirrors our own—that is what we for the most part vaguely assume, and then, without troubling our heads overmuch about the matter, proceed to enjoy the obvious sights and sounds with which bird-life provides us.

But in reality there are very great differences between the life of birds and the life of men. Perhaps the biggest single difference, and yet the one we are least apt to remember, is that all birds, except a few in the tropics, are more or less unsexed, made neuter, during half the year. The finches or buntings that fought and courted and bred so vigorously all summer, keeping together so closely in pairs, each bird jealous of rivals of the same sex, the pair jealous of intruders onto their nesting area, cock and hen full of amorous devotion to each other, then of parental devotion to the young—these same birds in

THE EVERYDAY LIFE OF BIRDS

winter lead a wholly different life. Then they are gathered together into flocks, in which there is neither sexual jealousy nor sexual attraction, no desire to sing, no parental feeling. Sometimes, indeed, the only imprint of sex upon winter life is the existence of flocks all of males, or all of females, as is often the case in chaffinches, the sexes shunning instead of seeking one another.

This neuter phase of behaviour is caused by a physiological change within, the reproductive organs shrinking in autumn to a twentieth or even a fiftieth of their full size, to swell again during early spring.

In some species, the unsexing process does not go as far as this, and mated birds remain constant to each other throughout the year. On a mild winter day one may see the separate pairs crystallize out, as it were, within a flock of jack-daws, the birds sitting about very obviously two by two. But even with these birds, the emotional state is wholly different in winter and summer, and each spring the cock-bird will renew his courtship just as if it were for the first time of asking, and he had not been mated for years.

We have only to reflect how extremely different human life would be if men and women were only to attract each other in the summer, and

THE EVERYDAY LIFE OF BIRDS

parents ceased to care for their children with the approach of winter, to see how remote a bird's life is from our own.

With migrant birds, there is a further complication. Twice a year they are seized with an impulse to leave their haunts and fly south or north as the case may be, often thousands of miles. This impulse is not a mere desire for change, such as sends human beings to the seaside in summer, or to Switzerland or the Riviera in winter: it is the result of some deep-seated alteration in the vital chemistry, and the urge itself is as purely instinctive and automatic as the instinct of a kitten to pounce on mice or of a worker-bee to build hexagonal cells of wax. Of the nature of this change in physiology, we know very little. Professor Rowan of Alberta has recently made some very interesting experiments, showing that with some birds at least it is the changing length of night and day, and not temperature or shortage of food, which is the first link in the chain of causes that brings on the migrants' impulse to move south in autumn. Kept in an aviary until mid-winter in their northern home and then released, the birds with which he experimented simply hung about the neighbourhood; if their physiology had been

THE EVERYDAY LIFE OF BIRDS

tampered with, and they had previously been kept under a regime of a day progressively lengthened by artificial illumination, they would when released even move northwards towards the Arctic and almost certain death.)

How instinctive it all is comes out still more clearly when we recall that there are some kinds of birds, like our familiar robin redbreast, which are not constructed so as to feel this impulse at the turn of the seasons, but stay all the year close to where they were hatched and bred.

Most, however, of our familiar temperate birds that we are apt to think of as resident, are not really resident at all; they are migratory in an irregular way, on a small scale. The thrushes of our winter hedgerows and gardens, the peewits of our winter fields, are for the most part not the same birds which bred there in the summer. Those have moved a hundred miles or so south; these are birds from the more northerly parts of Europe. This partial and irregular migration is half-way between the stationary residence of the robin and the full migration of the cuckoo and nightingale, and shows how the latter might have evolved out of the former.)

The discovery of the prevalence of partial

THE EVERYDAY LIFE OF BIRDS

migration was made possible through the practice of banding birds—attaching a light numbered and dated ring of metal to their legs, either when still in the nest, or after being caught in a special and harmless trap and subsequently set free again. A few of the hundreds or thousands of banded birds will be subsequently shot or trapped or otherwise recovered, and so we can keep track of their main movements.)

This banding method has also been used to shed light upon other sides of bird-life. For instance, a Mr. Baldwin in the United States put up in his big orchard a great many nest-boxes, most of which were occupied by pairs of the American house-wren. When they were snugly asleep in the boxes, he caught them and banded them. Now these birds always raise at least two broods in the season; and when the first brood was done with and the business of rearing the second brood was at its height, Mr. Baldwin caught and examined all his wrens again—to discover the surprising fact that about eighty per cent. of them had changed partners between broods, as human beings do between dances. They are very constant in their monogamy for the duration of one brood; but after that they separate and it seems to be a matter of chance

THE EVERYDAY LIFE OF BIRDS

how they pair up again for the next spell of married life.

Still another method, in which banding is combined with watching, has been used by Mr. Burkitt on robins. The birds are banded with bands whose distinctive mark can be recognized through good field-glasses; and a number of birds are thus followed all through the year, with surprisingly interesting results. The possibility of recognizing individual birds gives a new intimacy, a new concreteness of insight into their life. Similar schemes of individual marking have enabled naturalists to discover startling facts about other creatures, notably bees and ants; and there is no doubt that here lies ready to the hand of the bird-watcher a new and valuable tool which will enrich his watching if he has but the patience to use it.

Birds when we notice them are generally well fed or at least active. We rarely see them when they are ill or starving; we miss most of the violent deaths by hawk or owl. And so we are apt to forget the terrible mortality which all the time is thinning their ranks. But a little calculation will show how enormous this must be. A pair of blackbirds, for instance, has an expectation—barring accidents—of at least ten

THE EVERYDAY LIFE OF BIRDS

years of reproductive life; and each year will produce at least two clutches of about five eggs each—say a hundred eggs in all.

Accidents do of course happen, so that perhaps three seasons is more like the average number to which a blackbird, once arrived at maturity, can still look forward. This is thirty eggs—yet the race of blackbirds does not increase, which means that of these thirty, twenty-eight fail to reach the reproductive age again. Mr. Nicholson, from his observations, finds that more than half of these are eliminated even before the time comes to leave their nest. For robins, Mr. Burkitt estimates that at the beginning of autumn, a pair will have only one surviving bird left to show for all their season's labour. And all this is before the rigours of winter have set in.

For migrants, especially the smaller birds, the worst losses seem to be during the long migratory journeys themselves. The birds may be blown out to sea and drowned in thousands, or are so exhausted after long struggle with adverse winds as to fall an easy prey to their enemies on landing.

For residents, on the other hand, occasional years of great severity cause a real massacre. After the hard winter of 1917, for instance, long-tailed tits were actually wiped out over

THE EVERYDAY LIFE OF BIRDS

large areas of England, and it took the overplus of several favourable seasons to fill the empty spaces again. Famine and flood can take heavy toll of human populations; but man is never living so near the edge of security that one severe winter will exterminate all the human beings over a considerable area.

But it must not be thought that the life of birds is one long succession of disasters, or even a constant struggle. Man, and especially civilized man, has, so to speak, buffered the shocks of the environment—between its vagaries and himself he has interposed devices which temper the violence of its changes. He provides himself with fires in winter, fans and ice-boxes in summer; he adjusts his clothing to the weather, he tides over winter and bad seasons with stores of food; by artificial light he keeps the length of his day constant all the year round; in his houses he can shelter from the storm; he has wiped out the beasts of prey that were dangerous to him. But the birds must suffer the changes of environment in all their intensity. Thus most of their mortality will come from sudden catastrophes—the loss of a whole clutch of eggs through bad weather or egg-thieves; the loss of a brood of fledglings through cold, rain, or the death of a parent;

THE EVERYDAY LIFE OF BIRDS

the swoop of a hawk; an exceptionally severe winter or violent storms. Of their actual lives, a considerable proportion will be spent contending with really adverse conditions—just managing to find enough food to keep warmth in their wintry bodies, just struggling onto land through the storm, just dodging their enemies. But for the rest of their existence, when nature is favourable, life will be an easy time for them, and they will be able to spend hours sitting about and doing nothing, releasing superfluous energy in play, singing and making love, snoozing in well-fed indolence. They oscillate, in fact, between periods of severe testing—nature's examinations, in which failure means death—and easy times with an abundant reserve of leisure and strength.

I mentioned man's regulation of his day by means of artificial light. We are so used to this human trick that we find it difficult to realize the bird's complete dependence on the sun. In Scotland, for instance, the same robin which can be awake only for seven or eight hours in winter, has a sixteen- or eighteen-hour day in summer. And in the high north, there is no night—the birds doze when they feel like it at intervals through the single day of the Arctic summer.

THE EVERYDAY LIFE OF BIRDS

These, however, are generalities. The details of day-by-day life are also interesting. The real bird-watcher will like to know first how the birds he watches spend the hours of every day—what their routine may be, whether they have the whim to break it now and again for no apparent reason, how the weather and the food-supply influences and interferes with it. But to discover this, apparently so simple, he will have to exert all his patience, all his powers of concentrated observation. I can imagine no better test of a bird-watcher's keenness and capabilities than the attempt to work out the intimate daily life of one of the common birds round house or garden—be it robin or tit, chaffinch or swallow, thrush or blackbird, or even the vulgar sparrow. And it will not be merely a test—it will be an achievement. Very few people have taken the trouble to do this; and the amassing of a publication of intimate bird biographies of this sort is a necessary prerequisite to real ornithology, to the scientific natural history of birds.

I once had the privilege of accompanying Mr. Eliot Howard, one of that band of amateurs to whom scientific natural history owes so much, and who flourish perhaps more in Britain than in any other country, on his bird-watching

THE EVERYDAY LIFE OF BIRDS

rounds. He knows the two golden rules for getting valuable results from his watching—to watch individual birds, and to go on watching them for weeks or even months.

This particular season he was chiefly watching yellow-hammers, and his particular subjects were a pair of birds that were preparing to nest in a little Worcestershire valley where a lane bordered a furzy common. These birds had already staked out their breeding-territory for the season, and were to be found in the same spot every day. This territorial system, by which each breeding pair occupies and defends against intrusion a considerable area round its nest-site, is found in many birds, especially in those whose young are hatched naked. It serves to regulate the population to the food-supply.

We set out about five o'clock of an April morning (I should have mentioned that the third golden rule of bird-watching is to get up early), and as we walked towards the spot, he told me what he expected to see. The hen-bird, he said, sleeps in a large bramble-bush close under a wall; the cock in a little fir-tree a couple of yards beyond. The cock usually wakes a few minutes before the hen. He will hop about and chirp and perhaps sing a strophe or two; then

THE EVERYDAY LIFE OF BIRDS

she will emerge from her bedroom; then almost immediately he will fly at her, she will fly off, and the two will twist and turn through the air in what may be called the pursuit-flight—a regular part of courtship in yellow-hammers and many other small birds. They will come back, panting and exhausted, and then hop about for a little near their sleeping-places. The male will get on to his favourite perch and sing a bit, and then, about twenty minutes after their first waking, they will fly off together across the valley to feed on some ploughed fields there, for a couple of hours.

Everything happened exactly as he had told me—the sleeping-places, the times of waking, the pursuit-flight, the singing, the excursion to feed. There was one little difference—as the pair zigzagged down the road in the wild swerves of the pursuit-flight, a third bird appeared, joined in the chase, and dropped out as they returned towards their own corner. ‘Oh,’ said Howard, ‘I forgot to tell you that when the pursuit-flight takes them in that direction, close to the territory of another pair of yellow-hammers, it almost invariably excites the other cock-bird and stimulates him to join in.’

As we walked back to breakfast, I felt I had

THE EVERYDAY LIFE OF BIRDS

for the first time really got to know something about yellow-hammers.

One could go on talking about the everyday life of birds for a long time—the interest in the meanest domestic details of bird-life that comes when one realizes how the fouling of the nest is avoided, and sees the parent remove the nestlings' excreta in its bill, dropping them once it has flown a few yards from the nest. The pleasure of seeing a specialist at his job—a woodpecker making the chips fly as he excavates his nest (what an architecture his skull must have to take up the shocks without damage to the brain!); a nuthatch flying off with a nut to fix it in a crevice of oak-bark before cracking it open; a snipe plunging his bill up to the hilt in mud and leaving it there a moment so that its sensitive soft tip may detect the faint vibrations of scared worms wriggling off. The delight at finding a winter roosting-place of some small bird—a dozen wrens huddled in an old nest, tree-creepers crushed behind a bit of bark. (In passing, it is a good test of knowledge of birds to ask where they sleep—Where do thrushes go to roost? or chaffinches? or moorhens? Not one bird-lover in a hundred could pass an examination in this subject!) And there are the ques-

THE EVERYDAY LIFE OF BIRDS

tions which are raised by familiar facts:—why the mouths of fledglings are almost always bright-coloured—yellow is a favourite colour, though ravens', for instance, are rich crimson—and are sometimes, like those of young bullfinches or bearded tits, ornamented with special patterns in a contrasting colour; why thrushes begin singing earlier in the season than do Blackbirds; why sparrows pull yellow crocuses to bits, leaving those of other colours more or less untouched—and why they indulge in this propensity in some parts of England and not in others; why robins are so tame and such frequenters of houses in this country, when in many parts of the Continent they live shy secluded lives in the forests; (and to forestall possible queries, I may say that to most of such questions, we simply do not yet know the answers).

But my space is limited, and I must end. Searching about for a subject to make a close, I can think of none more suitable than their morning and evening choruses. A few mammals have the same habit, notably some of the monkeys and apes, but on the whole it is a typically avian characteristic. Who has not heard the evening chatter of starlings in their roosting-places? It sounds for all the world like conver-

THE EVERYDAY LIFE OF BIRDS

sation—the sound swells, and there are strange pauses, as in human society, when all fall silent at once. Bands of birds keep flying in from different quarters of the horizon, dropping steeply out of the sky to the roost; now and again a group, not yet fully settled for the night, takes wing again, flies round, and back to their sleeping-places. The cheerful babel goes on at full strength for perhap half an hour; often as the sun sets there is a sudden hush, and then the voices begin again; but they gradually diminish, the pauses grow longer and longer, until the silence is broken only by an occasional sleepy chirp; and finally all the congregation falls asleep.

Rooks, too, have these gregarious evening conversations; the repeated call of blackbirds as they go to their solitary roosting-places in the twilight is a familiar sound; and there are many other birds that end the day thus.

But even more of a special bird characteristic is the beautiful chorus of morning song on awakening, as dawn approaches. To hear that is a recompense for sleeplessness. Generally we miss it, as we miss the sunrise. Before setting about their business and searching for food for themselves or for their fledglings they greet the day. Each kind of bird has its time, one a few

THE EVERYDAY LIFE OF BIRDS

minutes earlier, one a few minutes later ; for something under half an hour there is this orchestra of bird-music, and then work begins, with song only at intervals, not concerted.

Robert Bridges, whose death we are just lamenting, has caught the moment and its beauty in one of his poems, setting it in contrast with the nightingales' lonely singing. It is thus he ends of the nightingales :

Alone aloud in the raptured ear of man
We pour our dark nocturnal secret ; and then,
As night is withdrawn
From these sweet-springing meads and bursting
boughs of May,
Dream, while the innumerable choir of day
Welcome the dawn.

IV
WATCHING THE COURTSHIP
OF BIRDS

IV

WATCHING THE COURTSHIP OF BIRDS

THERE comes a time in the career of the most ardent bird-watcher when his first enthusiasm begins to wane. The regular birds of the country have been recognized, their songs and call-notes learnt, their tricks of flight caught and memorized ; a good many of the uncommon species have been seen, and even some of the rarities. From the point of view of what one may call the collector of birds seen and recorded, the law of diminishing returns has set in ; only very seldom is he rewarded by the sight or sound of a species new or little known to him.

I had reached this stage about the end of my University career, when a lucky accident set me off on a new tack. I was spending some of the spring vacation with a reading-party on the coast of North Wales. The farmhouse we were in stood all alone at the end of a peninsula ; between the peninsula and the mainland was a bay, full at high tide, a glistening sweep of sand and mud at low tide. This place was the haunt of hundreds

WATCHING THE COURTSHIP OF BIRDS

of birds—ring-plover and sheldrake, curlew and various small waders, redshank and oystercatchers. They went on calling even through the night, especially when there was a moon.

I spent some time watching them, and soon saw the redshanks courting. It was one of the most entrancing of spectacles. Redshanks, cock as well as hen, are sober-coloured enough as you see their trim brown bodies slipping through the herbage. But during the courtship all is changed. The cock-bird advances towards the hen with his graceful pointed wings raised above his back, showing their pure-white under-surface. He lifts his scarlet legs alternately in a deliberate way—a sort of graceful goose-step—and utters all the while a clear far-carrying trill, full of wildness, charged with desire, piercing and exciting. Sometimes as he nears the hen he begins to fan his wings a little, just lifting himself off the ground, so that he is walking on air. The hen will often suffer his approach till he is quite close, then shy away like a startled horse, and begin running, upon which he folds his wings and runs after. She generally runs in circles, as if the pursuit were not wholly disagreeable to her, and so they turn and loop over the gleaming mud. Then she pauses again, and the tremulous approach is again enacted.

WATCHING THE COURTSHIP OF BIRDS

I did not, of course, manage to see or grasp all this at once. It had to be pieced together as the result of several spells of watching, day after day. Other things I saw too—violent encounters between rival males, which generally resolved themselves into interminable pursuits, the one seeking to chase the other away from his own domain, the other continually turning and running back; the beautiful song-flights of the cock-birds, when they mount with one clear, melodious note to descend with another; and so on. And I discovered that here was a whole new world of watching to be undertaken, rich in sights fascinating in themselves, and full also of meanings which had to be puzzled out and unravelled. And watching and studying the courtship of birds has been a never-failing hobby to me ever since.

As showing some of the interest behind bird courtship, I will take another sight I first saw in this Welsh bay. Oyster-catchers frequented the rocky beach at the bay's outlet; and here I used to hear them make a penetrating piping. Watching them at this, I saw that sometimes two birds and sometimes three were piping together, running round each other in short curves in an excited yet formal way, their heads pointed

WATCHING THE COURTSHIP OF BIRDS

down so that the just-open bill was almost touching the ground. Or on other occasions three birds would be together, but only two were piping. What did all this mean?

I had not much time to watch them then, and did not find out till over fifteen years later, when I went to Holland with a party of bird-watching friends deliberately to study the courtship habits of various wading-birds. Oystercatchers were very abundant and could be easily watched; and I made up my mind to make them one of my special studies. A Dutch ornithologist who stayed a few days with us could not understand my spending so much time watching them—"but they are such common birds," he said, "and you can see them anywhere." However, I persevered, and was, in my own estimation at least, amply rewarded. I found that, apart from a special kind of flight with formal stiff wingbeats, this piping appeared to be the only method which the oyster-catcher possesses of expressing his or her emotions, whether of love, jealousy, or hostility. It was used when a single cock was paying court to a hen; when the hen's emotions were well tuned up, she might use it too, so that there was a piping duet; it was used by a mated pair when another pair trespassed on to their

WATCHING THE COURTSHIP OF BIRDS

territory, or when an unmated bird trespassed into a pair's family circle. Further complications arose owing to the fact that, as with many other birds, excitement is infectious. If one bird begins piping round a female in the middle of a flock, for instance, a number of others are almost certain to join in, and you may see regular 'piping parties' of ten or a dozen birds. These are interesting, for they are half-way to being social functions, like dancing. And finally, since piping is the sole expression both for jealousy and love, when both emotions are present, as when two rivals are courting a single female, either emotion reinforces the expression of the other, and the piping becomes exceptionally vigorous. This is what seems to be happening when you see the trios of two birds actively piping to a third. They are two cocks courting one hen—often one of them her rightful mate, the other a rival who has come to join in the fun when he saw the other begin piping. As they twist and turn, each sees first the desired hen-bird, then the hated rival; and each sight stimulates to renewed piping. So the frenzied piping dance goes on; and sometimes it may rouse the female so that she too begins to pipe.

This curious restriction of the means of express-

WATCHING THE COURTSHIP OF BIRDS.

ing emotion is another reminder of the much greater fixity of the behaviour of birds as against that of human beings. An extremely entertaining result of this limitation was recorded recently by Dr. de Haan for an argus pheasant in the Amsterdam Zoo. The male argus pheasant has a long tail, but his chief adornment is a beautiful decoration along the quills of his wings. In courtship, he throws his wings up and forward, making a bell—like the bell of some great flower—behind which his head and neck are completely hidden. This he directs towards the hen, while putting his head so that he can peep through the feathers and judge of the effect on her. In the species of argus pheasant to which the Amsterdam male belonged, the hen generally stands quiet for a little before the cock when he gives his display, even if she does not always show great interest. But at Amsterdam they only had the hen of a second species of argus pheasant; and she would not stand still when the male began his courtship, but wandered erratically about the cage. The cock-bird threw up his wings, peeped through—and the hen was already almost out of his field of vision. He furled his great pinions, ran round until he thought he saw another opportunity, threw himself into the

WATCHING THE COURTSHIP OF BIRDS

flower attitude again—and was again disappointed. This went on for a few days, the cock wearing himself out in his hectic efforts, until finally he gave up in despair, left the restless hen to her own devices, and proceeded to display before an object which if unresponsive was at least stable—namely the trough in which his food was put out!

It is worth noting that in this perverse transference of his attentions he did not select just any casual object, but one which already had pleasurable associations. And indeed, this linking up of emotionally charged objects with courtship is in other birds often seen as part of their normal behaviour. The most frequent of such associations is between courtship-display and the handling (or rather 'beaking') of nest-material. Male warblers posture before the female with leaves in their mouths. Herons and egrets build nests out of sticks; after they have been relieved at the end of a spell of incubation they present their mates with sticks, to the accompaniment of an elaborate display-ceremony. Crested grebes build with sodden water-weeds, and have a wonderful joint-ceremony in which both birds of a pair dive for weeds and then, holding them in their bills, swim at each other and leap up to

WATCHING THE COURTSHIP OF BIRDS

meet, breast against breast. Adelie penguins lay their eggs in a little depression bordered by stones, and the male, as part of his courtship, fetches stones to lay at the hen-bird's feet.

The Adelie penguin also provides an illustration of the linking on of courtship activities to objects productive of other emotions. Dr. Levick, who was camped during a whole breeding-season next door to an Adelie rookery in the Antarctic, records how the birds used to come up with stones and ceremoniously present them to the sledge-dogs and the human members of the camp. In this case it seems that the large and unfamiliar creatures excited some feeling of wonder or interests in the breasts of the birds; and they expressed it by the only means at their command.

Penguins introduce us to another interesting fact—much of their courtship is mutual, male and female simultaneously posing or displaying to one another. The display is rather ludicrous to our eyes, as it consists in pointing the beak straight up with a very sentimental, languorous expression, at the same time drooping the body, spreading the flippers, and emitting a soft humming noise. But it is a pose charged with tender emotion, as evidenced by the term used by

WATCHING THE COURTSHIP OF BIRDS

Dr. Levick to describe it—‘the ecstatic attitude.’ Sometimes a bird on the nest would be overcome by emotion and would go into the ecstatic attitude all by itself.

As a matter of fact, in a great many birds such mutual display is the sole or the usual method of courtship. When we consider a large variety of birds, it soon becomes clear that there is a general rule—namely that mutual courtship is usually found where both sexes share more or less equally in the reproductive duties of building the nest, sitting on the eggs, and feeding and guarding the young, whereas purely masculine display is usually found where the cock-bird does not help brood the eggs; and it is at its height—as among pheasants, peacocks, ruffs or blackcock—where the male never comes near the nest or young at all. Apparently in the former case the necessity for making the sexes similar in respect of their brooding and parental instincts has overflowed, so to speak, onto their other characters, and made them alike in plumage and in display as well.

A striking example of mutual courtship is seen in the albatrosses. The courtship of several species has been described, and is in each case essentially as follows—the two majestic birds stand fronting

WATCHING THE COURTSHIP OF BIRDS

each other, spread their wings, throw back their heads, and finally end by both stretching their necks and heads vertically upwards and together emitting a repeated ringing trumpet-like cry.

The grebes, which I have already mentioned, also have wonderful mutual ceremonies; it is an illuminating fact that though their courtship is as beautiful and as strange and fantastic as that of any gaudy tropical creature, and though they live and breed in reasonable numbers in England, even within forty miles of London, no one had taken the trouble to watch and record it thoroughly until the present century.

I have not the space to describe it here—besides, I have set it down in print elsewhere—but I must refer to one interesting side-issue. The commonest form of courtship-ceremony in grebes is for the two birds to front each other with their slender white necks raised to the full, their chestnut-and-black ruffs and ear-tufts partially spread, and then to shake their handsome heads at each other, first rapidly, then slowly, and so on in alternation, to the accompaniment of excited little barking noises. Now where courtship is mutual, it takes two to make a display; whereas it is doubtless very enjoyable to head-shake together, it is no fun, it seems, to

WATCHING THE COURTSHIP OF BIRDS

do so by oneself or to an unresponsive mate. Sometimes you will see a pair dozing on the water; one bird—let us say the cock—wakes up, approaches the hen, and shakes his head ever so slightly at her, as if to say ‘come on, old thing.’ She perhaps just takes her beak from under her wing, but speedily puts it back again—too lazy to respond. He may try once or twice again, and still find her unresponsive. If now, swimming restlessly up and down, he spies another hen grebe, unmated or temporarily alone, on the water, he will swim up to her and start his head-shaking advances, to which she will almost invariably respond. Here, coupled with strict monogamy during the season, we see the existence of what can only be called flirtation. The flirtation is quite innocent—it never seems to lead on to anything more serious than the excited head-shaking; but none the less, it always has the effect of waking up the rightful mate, however lethargic she may have been before.

As an example of the puzzles that beset the bird-watcher, I will record an actual instance of what happened in such a case; it was in the first day or so of a fortnight which I spent watching grebes, before I had any inkling of what

WATCHING THE COURTSHIP OF BIRDS

it was really all about. I saw a male grebe half-way between two females. He swam to one, shook his head a little, then swam to the other, fifty or sixty yards off, and there followed a vigorous bout of head-shaking between them. Suddenly there was a great commotion. The female of the head-shaking couple flew off with a squawk; from below the surface there emerged another bird; and, after some splashing and rapid turning, she proceeded in her turn to indulge in a bout of head-shaking with the cock. At the time, this was all Greek to me. It was only after another week or so of frequenting that grebe-haunted sheet of water, turning a telescope onto every happening that seemed interesting, taking copious notes, and thinking over my notes at night, that it became clear. The cock-bird was flirting; the hen had woken up and dived to the attack in the way characteristic of grebes, who attempt to spear their rivals in the belly from below the surface with their sharp-pointed beak; the odd bird, thus painfully reminded that she was an interloper, flew off; and the rightful mate, instead of attacking her errant husband too, as might have been logically expected, was excited by his misdemeanour to a vigorous outburst of that head-shaking expres-

WATCHING THE COURTSHIP OF BIRDS

sion of affection which only a few minutes before she had refused him. It was a subtle and interesting working of the avian mind.

The study of courtship, indeed, would be expected to throw light on the minds of these winged and feathered creatures, so like ours in some respects, so very unlike in others—more light, perhaps, than the study of any other single aspect of their behaviour. For here we have an exceedingly strong impulse at work, often without the opportunity of immediate gratification; we have rivalry, jealousy and all the other complications of sex; we have the sexual motive interwoven with the instinct to defend the territory round the nest, and with the brooding and parental instincts; we have the mental association with nest-building and nest-material. It is not enough to study animal behaviour by means of experiments in the laboratory. That, of course, is absolutely necessary to understand the precise way the brain machinery works in this or that particular situation; but in order to know the range of situations normally open to the bird, and the variety and richness of the behaviour with which they are met—for that we must go to Nature, and rely primarily upon patient watching.

WATCHING THE COURTSHIP OF BIRDS

Besides throwing light on psychology, the watching of bird-courtship can throw light on evolution. Much of the posturing and displaying of courtship may be simply the direct outcome and expression of the intense excitement of the breeding-season and of unsatisfied sexual desire. But this cannot apply to the many cases of special plumes, like the train of the peacock, which only come into use during courtship, or even, like the feather frill of the ruff or the crest of the crested grebe, are only grown in the breeding-season as well as only being employed for display. These, according to our present biological knowledge, cannot have been developed and fixed in the race because of any excitement to the individuals of each generation; and they are much too elaborate and adaptive to have any merely accidental origin; but they can only have been evolved because they were in some way useful, and have been developed through a slow process of selection, individuals which happened to be endowed with better adornments having an advantage over others, and accordingly bearing more progeny. It was Darwin who first reasoned this out; in the case of birds with brilliant-plumaged males, he argued that their adornments must serve to secure success in winning

WATCHING THE COURTSHIP OF BIRDS

mates, and that it was through this means that the best adorned specimens would gain advantage, by having more chance of perpetuating their characters in their offspring. To this process he gave the name of sexual selection.

And as a matter of fact, in one or two cases bird-watching has given confirmation of Darwin's bold and far-reaching theories. The ruff, for instance, is a wading-bird which in the winter is very much like half a dozen other kinds of medium-sized waders. In the spring, however, the male grows round his face the astounding frill' or ruff of feathers from which the species takes its name. Not only that, but every male is a law unto himself. Some grow black ruffs, others ruffs that are white, sandy, brown, grey, pepper-and-salt, and half a dozen other shades. In addition, the tufts on the head may be of different colour from the main ruff. These brilliantly adorned males assemble on what is generally called a 'hill'—a slightly raised spot of ground where they dance in exuberance of excitement or spar and duel with each other while waiting for the hens. The hens visit these masculine assembly-places solely for the purpose of choosing mates. When one appears on a 'hill,'

WATCHING THE COURTSHIP OF BIRDS

the males flop down to the ground with ruffs fully erected and wings often outspread, and wait her pleasure as if hypnotized. She has complete freedom in choosing, and signifies her choice by tapping one of the cock-birds with her bill.

Now Edmund Selous, that indefatigable watcher of birds, built himself a hide close to a ruff assembly-place in Holland, and watched there almost every morning throughout the major part of the breeding-season. As each ruff on a 'hill' is differently coloured from every other, the individuals can be told apart; and so by patient and prolonged watching and taking of notes Selous was able to establish the simple but vital fact that different cock-birds differed very much in their success with the opposite sex. Some never succeeded in winning a single mate all through the weeks he watched. One secured more mates than all the others put together; and it was notable that this bird had a very finely developed and brilliantly coloured ruff. Thus for ruffs at least the essence of the Darwinian hypothesis seems proved; and, by the way, the bird-watcher was needed to give this proof, for we could never have been sure from observation or experiment on captive birds that

WATCHING THE COURTSHIP OF BIRDS

the same processes were at work in a state of nature.

It is probable that the same influence of female choice makes itself felt in other polygamous or promiscuous species, of which the blackcock is a good example. But when we come to the common song-birds, for instance, matters are much more complicated. In warblers, for instance, and buntings and finches, which Eliot Howard has watched so thoroughly, real courtship-display does not begin until *after* the birds have paired up for the duration of the season or the brood, and so can have nothing to do with the selection of mates. And the same seems to be true for the elaborate mutual courtships of grebes, herons, and other birds. It would take too long to go into the complicated question as to where the utility and function of this kind of courtship lies; it must suffice to point out the interest and difficulty of the biological problems which intensive bird-watching has raised, and which can only be solved in full by more watching.

The courtship of birds is a reminder of the strange complications which have been introduced into the history of evolving life by the mysterious fact of sex. I say mysterious deliber-

WATCHING THE COURTSHIP OF BIRDS

ately; for although we now know how sex is determined in higher animals, and understand what the value of sexual as opposed to sexless reproduction is to the race in its evolution, we have as yet no clear idea as to what first caused sex, how and why it ever originated at all—and this in spite of the fact that sex is for all of us an unescapable physical fact, and in some form or another permeates our thinking in all but universal fashion.

Courtship is a by-product of sex, which arises when mates have to be won and when their eyes and ears and brains have reached a high enough evolutionary level to appreciate stimulating displays, bright colours, strange shapes, or striking sounds. It is a reminder of the fact that sex, for all the trouble and complexity it has brought into the world, has been a great generator of beauty also, not only for us humans, but in all the highest twigs of the evolutionary tree of life. The bird-watcher who watches courting birds is gleaning some of this beauty for himself; if he watches assiduously and records faithfully, while at the same time taking the trouble to read up the most important of the studies of others on the same subject—for only so can he avoid falling into many obvious pitfalls due to

WATCHING THE COURTSHIP OF BIRDS

wrong preconceptions and lack of knowledge-- if he is willing to do this, he will also be giving material help to biology in her business of trying to understand the how and why of the workings of life.

V

THE MIND OF BIRDS

THE MIND OF BIRDS

WE all of us quite naturally begin with the assumption that other living things have the same sort of minds as ourselves—they happen not to be able to talk, to do mathematics, or to frame philosophies or religions, but in general we take for granted that they feel and think, remember and plan in the same sort of way as we do. Closer observation, however, and especially deliberate experiment, quite destroy this assumption. The lower animals do not talk and calculate and philosophize just because their minds are *not* like ours—they are on quite a different and lower level.

Many people are apt to resent this conclusion and to think men of science cold and soulless for pronouncing it. It always seems to me, however, one of the most exciting and encouraging of ideas to reflect that our minds have been perfected by slow steps from the most rudimentary beginnings, and that there is no more reason to suppose that further evolutionary progress is not possible, towards minds which would stand in

THE MIND OF BIRDS

the same sort of relation to our imperfect instruments, as do our minds to the still more imperfect instruments of a shrew-mouse or a newt. It is from this point of view that I like to think of the minds of the birds I watch, as mental instruments forged out of the metal of life on the anvil of circumstance by the impersonal but inexorable agency we call evolution. They are in all essentials more primitive mental instruments than ours, though in this or that particular they may reveal some advantage of sense, some novelty of instinct.

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The common and natural line of argument to take is that because the actions of birds are adapted to the biological needs of their lives, therefore they are obviously planned out in the birds' heads—that the apparent purpose of successful adaptation means a real purpose in consciousness, that, to come down to the concrete, birds build nests because they know they must have a place to lay their eggs in, migrate because they know of the approaching cold of winter and wish to reach the familiar warmth of the south, sing because they deliberately wish to attract a mate. Such suppositions, however, are untrue. Birds may build nests or sing songs even

THE MIND OF BIRDS

when brought up by hand from before the time they were fledged, without seeing any others of their kind and without the possibility of being instructed by parents or companions (of which indeed experiment shows them incapable). The apparent purpose must be only apparent, not real.

Of course the actions of an animal must on the whole achieve their end, otherwise the species could not continue to exist; but it is by no means necessary that the end be perceived in the mind of the animal, much less deliberately planned and purposed by it. The usual procedure of Nature is this—that the brains of animals shall be so constructed that in a given set of circumstances impulses will be aroused which impel them to actions adapted to the circumstances, in just the same blind and automatic way in which our bodies are constructed to do the right adaptive thing quite irrespective of our minds knowing anything about it. Our stomach is constituted so as to pour out gastric juice when wanted, and to digest food—it achieves its end admirably. But nobody ever consciously planned to make their gastric juice just of this right composition, nor even purposed to liberate it just when it is needed.

As a very simple example of adaptive but

THE MIND OF BIRDS

wholly unintelligent instinct, take the crouching of many young birds, such as those of various plovers, when danger threatens. In their natural haunts, this is an admirable method of escaping detection, for their colours blend with the surroundings. But they will crouch just as readily on a lawn or a carpet, against which they are conspicuous in the extreme. Their instinct to crouch is in fact as automatic and unpurposed as their colour. Another piece of adaptive but apparently quite instinctive behaviour we may cite is the actions of many ground-breeding birds when an enemy threatens their eggs or young. They trail their wings on the ground and shuffle along as if badly wounded, only to spring into the air when the enemy has been lured far enough from the nest. Here again, all the evidence is against the bird having any conscious purpose or knowledge of what it is doing; the shamming wounded is an inborn pattern of behaviour, like sneezing in ourselves.

As a curious example of lack of intelligence we may take the well-authenticated fact that some birds, when they begin a nest against one rung of a ladder or on one of many similar rafters, seem wholly unable to keep the situation distinct, and proceed to build a whole series of

THE MIND OF BIRDS

nests against all or most of the rungs or rafters. In nature, every situation is a little different from every other; here, man's artificiality has been too much for them with its repetition of sameness. How remote from ours is the mind capable of this lack of discrimination!

Equal dissimilarity behaviour from a human type of mentality, though in a rather different way, is provided by the numerous recorded examples of comparatively clever birds like jackdaws which do not know when to stop building in cases where more bringing of nest-material is useless. Jackdaws breed in holes, and drop sticks into them to make the foundations of their nest. Sometimes it happens that a nice-looking hole communicates with some bigger space below, and the sticks simply drop through. But once the birds have chosen a hole they may continue bringing and dropping in sticks for days and days until a really enormous pile accumulates in the hollow trunk below, although after a few hours' work it should have been obvious to the meanest intelligence that they were wasting their time. The reason they never realized it was simple—that in respect of nest-building birds do not and are not required to use intelligence, being endowed by Nature with instincts which normally are

THE MIND OF BIRDS

quite good enough. The perfection of these instincts is seen in such exquisitely finished nests as those of weaver-bird or tailor-bird or our own long-tailed tit; while the fact that they are only instincts and not intelligent activities is seen by such incidents as that of the persevering jackdaws I have just quoted.

Mr. Kirkman has recently conducted a number of interesting experiments on blackheaded gulls¹ and finds that they, while the brooding urge is on, can be made to accept stones or even sardine-tins and sit on them apparently quite happily—a complacence rivalled in Nature by that of the emperor penguin whose passion for brooding *something* will induce it to incubate lumps of ice if eggs are not available.

It is this perverse acceptance of substitutes for normal eggs and young which makes possible the parasitism of the common cuckoo. It is surely the very nadir of intelligence for a pair of wretched meadow-pipits or hedge-sparrows to go on caring for a young cuckoo just because he happened to be hatched in their nest, although he eventually grows four or five times as bulky as his foster-parents, and to feed him at all they have to perch on his shoulder or head.

¹ These experiments, I am glad to say, are shortly to be described in full in a book by Mr. Kirkman.

THE MIND OF BIRDS

In Chance's remarkable film, *The Cuckoo's Secret*, occurs an illuminating incident which forcibly reveals the deficiencies of bird-mind. The young cuckoo is first seen, in the absence of the old birds, heaving one of the fledgling meadow-pipits, his foster-brothers, out of the nest. It caught its foot a few inches from the rim of the nest, and hung there squeaking. After a little, the mother bird returned with food. Her unfortunate offspring was in full view and hearing; yet she did not attempt to get it back into the nest or even to feed it, but went straight to the young cuckoo and put the food in its capacious gape.

It would thus seem (and there are many other bits of evidence in support of the idea) that birds react much more to whole situations than we do, and are much less capable of distinguishing single objects as separate. What appeals to the mother bird and touches her parental instinct is not a young bird as such, not *her* young bird as such, but a young bird—more or less any young bird—in the proper situation, which is within the nest. It is as if a human mother were perfectly willing to adopt a young gorilla if she found it in her nursery, and to pay no attention to her own baby though it was howling in full view but on the other side of the street.

THE MIND OF BIRDS

This is not to say that birds cannot and do not learn; but they are only capable of limited learning, and do much more of the business of life untaught, instinctively, than we do. Flight, that most amazingly complex of all physical activities, comes untaught to birds; they do not have to learn how to migrate, nor how to build a nest (though a certain improvement in this may come with repetition), and the great majority of them will sing the characteristic song of the species even if kept out of hearing of all others of their kind.

If you put up nest-boxes and have the good fortune to have a wryneck for one of your tenants, you can treat yourself to a first-class demonstration of the elaboration which purely unlearned instinctive behaviour may attain. Remove the lid of the box when the bird has been incubating for some time, and look in. She will press herself against one side of the cavity, with head pointing upwards, and then with an amazingly snakelike motion raise herself towards you, still all flattened against the side. When she has extended herself to her full height, she suddenly gives a ferocious hiss, and at the same moment shoots back, scattering the eggs in every direction over the bare bottom of the

THE MIND OF BIRDS

box. Even though you can see that she is only a harmless little bird, the trick is very disconcerting, and you find yourself hastily drawing back and in danger of losing your balance; in the all-but-darkness of the bird's natural nest, and to a small egg-stealing animal, the effect must be overwhelming. And yet the whole procedure appears to be purely instinctive, entirely the result of the mental clockwork with which wrynecks are endowed by heredity, performed without any conscious imitation of a snake or indeed any purposeful planning whatsoever.

But to make up for their relative lack of intelligence, birds are extremely various and intense in their emotional natures. As cause of this, it is natural to look first to their high temperatures. The rate at which chemical processes take place, including the chemical processes of life, goes up with temperature, being roughly doubled for each rise of ten degrees centigrade, and the normal temperature of birds is keyed up to what in men or any other mammals would be dangerous fever-heat. Besides this, birds are constructed to undertake that most arduous of all vital activities, flight. Thus they must have a reserve of energy and power which readily bubbles up, and can express itself in vivid and

THE MIND OF BIRDS

striking ways. It is from a combination of these two causes that birds provide us with such amazing exhibitions of combined physical and emotional energy as the skylark singing his way up to the sky, the unceasing duels and wild dervish-dancing of ruffs or blackcock on their assembly-places in the breeding-season; that the robin will respond to a warm day in winter and a slight lull in his struggle with the cold by an outpouring of song; that a pair of herons or egrets will burst out with a wild expression of mutual affection each time they see each other again after a few hours' absence, all through the long months of the nesting-season; that the redwings, in late winter, will gather together on wild days and give a communal concert (I have heard them even on Hampstead Heath), though still in a strange land, far from their Scandinavian summer homes.

Birds are thus on the whole lower than mammals in pure intelligence, higher in pitch of emotion and intensity of living. This is the background against which we must remember to interpret their actions. But what I want to speak of in the rest of this chapter is the insight we get into the mind of birds by watching them in the field.

The first point which will strike even the most

THE MIND OF BIRDS

casual observer is that different kinds of birds are endowed by nature with different kinds of temperaments. The common whitethroat is a restless excitable creature, always fluttering up and diving down again into the hedgerows, while the hedge-sparrow is sober and retiring; the robin, for all his charm, is exceedingly pugnacious; the house-sparrow we all know as impudent and cunning, with a nature quite different from that of his close relative the tree-sparrow.

But after we have given a character to each familiar species of bird, we find that this is only a very general character, and that within the species there is great individual variation of temperament as well. There is enormous difference in the timidity or courage of birds within a single species. One hen will shoot off from her eggs as soon as a human being appears in sight; another will sit tight and let herself be watched and photographed at close range. The red-throated diver, for instance, is not usually a very close sitter; but one bird we came across in Spitsbergen had actually to be forced off her nest by gentle pressure with my boot (her sharp beak precluded the use of hands) before we could see what she was sitting on.

THE MIND OF BIRDS

Such individual variation is often very noticeable in respect of the dawning æsthetic impulse which prompts many birds to adorn their nests. This in itself is a strange phenomenon of bird-mind. It is strange that one of the American fly-catchers should always decorate its nest with a strip of a snake's cast skin—though it has been suggested that this may perhaps frighten egg-thieves; but why should buzzards and eagles and other birds of prey bring green leafy branches to lay on their nests and renew them from time to time during incubation? Why should various plovers put shells and bright pebbles round the edge of the little depression that serves them as nest? We can only suggest that it is, as I said, an early germ of the æsthetic impulse, akin to that which prompts magpies and crows and jack-daws (including the celebrated bird of Rheims) to carry off and hoard bright shining objects. But whatever the precise nature of the impulse, it is nearly as variable in its manifestations as the artistic impulse in human beings. Of a dozen Kentish plover nests, most will be moderately decorated, one or two will be very richly garnished, one or two will have no decoration at all.

Then watching may reveal curious associations and transferences in the mind of birds. In a

THE MIND OF BIRDS

previous talk I spoke of the frequent association between courtship and nest-material. Another simple and frequent association is seen in most kinds of birds in which the cock-bird feeds the hen as part of his courtship attentions to her. In such cases the female almost invariably adopts the same plaintive fluttering attitude seen in young birds already fledged, which are begging for food from their parents. Titmice are a good example of this harking back of the female to a youthful attitude. A more obscure association is that between courtship-displays and other activities of the birds which have no obvious connection with sex or reproduction. In crested grebes, for instance, the head-shaking ceremony which I mentioned in a former chapter is almost always accompanied by occasional dips of the beak below the point of the wing. It is the same gesture as in preening the wing-feathers; but during the courtship-display, it is only a reminiscence, a mere ghost of real preening, and is sometimes so abbreviated that the beak is brought back without ever touching the wing at all. Swans, too, intersperse their rarely seen but beautiful mutual courtship with a reminiscence of that common swan gesture of throwing the neck back and rubbing the head against the

THE MIND OF BIRDS

feathers of the back. These queer, automatic-looking actions can have no value in themselves, but must be a strange by-product of the way in which the mind of birds is constructed. Even if the bird-watcher does not understand what they may mean, he has the satisfaction of posing a new problem to the psychologist.

The penguins offering stones to dogs and men instead of to their mates, and the argus pheasant displaying to his food-trough, which I spoke of before, provide examples of the transference of emotion or its expression into unusual channels. This is not very uncommon among birds; you can elicit a good example of it any spring by throwing stones into an osier patch which harbours some sedge-warblers. On this the cock-birds will almost invariably burst into song; song, the normal expression of sexual emotion and general well-being, has been commandeered as outlet for the birds' feeling of anger.

Another very curious side of bird-mind is one which was first stressed by Edmund Selous—namely the way in which hostility between two rival males so often finds outlet in strangely formal posturings and mock combats instead of in genuine fighting. A male swan will ruffle up to an invader of his territory in fear-inspiring

THE MIND OF BIRDS

pose—breast puffed out, neck curved back, wings arched; the trespasser will adopt the same pose; but instead of coming to blows the two will circle round each other grandly but harmlessly, until honour, it seems, is satisfied, and the invader swims off or the two separate as if by mutual consent. It is the rarest thing for a genuine fight to develop between two swans. The same is true for very different kinds of birds, such as stockdoves; and even the constant duellos of ruffs on their assembly-grounds are much more in the nature of sparring-practice than of dangerous fights. Here again, possibilities of great biological and psychological interest lurk behind the facts; but for the moment what we need is more watching and more facts before we can try to generalize.

Another strange bit of bird psychology is the mobbing of hawks, owls, and cuckoos by many kinds of small birds; and still another is the extraordinary talent for mimicry of other birds' notes which is indulged in by quite a number of species in a state of nature. The mocking-bird of America is perhaps the supreme example, but the blue jay, the common starling, and the sedge-warbler are masters of the art, and I have been deluded by a blackbird mimicking a nightingale. Here again we can see no utility

THE MIND OF BIRDS

attached to the practice, and it seems to be a mere by-product of their nature. But why is it found in some species, and not in others, though closely related? Why does one bird practise it in nature, and others, like ravens, only when taught?

As you see, a great deal of what I have been talking about consists of facts which pose unanswered questions. This is at least a challenge to the bird-watcher to go on with his watching and produce new observations. Puzzling facts are rarely to be cleared up by speculation alone; almost always they need the illumination of new facts for their explanation. It is also a reminder that bird-mind, if not especially characterized by high intelligence, is yet complicated enough, and a study full of interest. Let us remember that in the long history of life, mind has evolved as well as body, and that in studying birds, we can be studying a particular phase in the evolution of mind, that strange and mysterious property of living creatures with which—let us face the fact frankly—the present scientific scheme of things, coherent though it be, and ever more embracing, is still very incompletely linked up, and whose eventual incorporation in that scheme will cause upheavals of thought as great as those due to Copernicus or Darwin or Einstein.

VI

THE BIRDS' PLACE IN NATURE

VI

THE BIRDS' PLACE IN NATURE

To watch birds is delightful enough in itself; but most people like a background against which they can set their observations.

These feathered creatures, what are they in the economy of Nature? What is their history, what may be their future? How do they compare with other kinds of living things?

The master-key here is the idea of evolution; it unlocks the door through which alone our biological backgrounds become visible. There are no other animals built in at all the same way as birds. How did they come to evolve into their present condition?

The first thing that evolutionary study teaches us is that birds were not always so different from other creatures as they are to-day. The few fossil birds known from the Upper Cretaceous age, seventy or eighty million years back, all had teeth like any lizard. When we reach the Jurassic period, nearly twice as long ago, the only two specimens of birds so far found were so unlike any ordinary bird in their construction that, if

THE BIRDS' PLACE IN NATURE

it were not for the lucky accident of their having been embedded in such fine mud that the imprint of their feathers is still preserved to us, we should have been in doubt as to whether they were birds at all. They might almost equally well have been exceptionally agile reptiles, for they were toothed, had long jointed tail-bones, and big claws on their fore-limbs. And before this time in the world's history, for all the hundreds of millions of years since life began, there were no birds at all.

Birds, in fact, are the offshoot from one kind of very active reptile, probably related to some of the smaller Dinosaurs. They became birds through the evolution of feathers out of scales, which first, by acting as a heat-retaining blanket, allowed their temperature to be kept at a high level, well above that of their surroundings, and secondly made flight possible. The other peculiarities of modern birds, such as their using their high body-temperature to brood their eggs, the transformation of their originally long and awkward tail, like a kite's, into an efficient rudder-fan; or the lightening of their dead weight by the substitution of horny beaks for heavy teeth—all these came later. By about forty or fifty million years ago, all birds had be-

THE BIRDS' PLACE IN NATURE

come of the essentially modern type; nothing has happened since then save a perfecting of the different branches—duck, or hawk, or song-bird—for particular modes of life.

There have been three other groups of animals to achieve true flight; one, the flying insects, arose from a wholly different stock; and two from the same backboned stock to which the birds belong—the flying mammals or bats, and the flying reptiles or pterodactyls, the latter all long extinct.

The great advantage which the birds had over their vertebrate competitors in the art of flying was that they, possessing feathers, could make a wing of these; while the skinny flight-membranes of bats and pterodactyls had to be stretched taut and so demanded attachment to hind- as well as to fore-limb. Bats cannot run or hop, nor could pterodactyls; their legs are subordinated to their wings. But birds kept their legs clear of this entanglement, as the ancestors of man kept their fore-limbs clear of running; and so birds were free both of the air and the earth, one pair of limbs for each element.

Insects are the equals of birds in this respect; but they are inferior in another. They can never grow big. It would take too long to go into the

THE BIRDS' PLACE IN NATURE

reason why, but the fact remains; an insect as big as a swan or even as a thrush is, luckily for us, unthinkable. Small size is in itself a disadvantage; it brings the further disadvantage in its train that it prevents an animal having a constant temperature higher than its surroundings, for its bulk is so small in proportion to its surface that the heat generated by the chemical combustion in its muscles all leaks away in no time.

So insects are not only small, but the whole tempo of their lives goes up and down with the temperature of the outer world. They cannot achieve the constancy of living possible to a bird or mammal, and are at a great disadvantage in winter, being put out of action more or less completely by the cold.

However, though birds can grow big in comparison with insects, they are limited in size in comparison with other vertebrates. This comes from the fact of flight; the laws of aerodynamics make it very inconvenient for a flying bird to weigh much over fifty pounds, and quite impossible for it to weigh as much as a horse or even a leopard. It is only the birds which have given up flying, like ostrich or cassowary, or the extinct moa or dodo, which have even begun

THE BIRDS' PLACE IN NATURE

to grow big according to mammalian or reptilian standards.

(In passing, these considerations show what a biological impossibility is the conventional winged angel. Mr. Haldane has taken the trouble to calculate that an angel of average human stature would require such huge muscles to move his wings that they would have to project four or five feet in front of his sternum.)

The stock size for birds, in fact, is from something under an ounce to about ten or fifteen pounds; their construction forces them to play their rôle in the world within these limits of weight.

The next valuable light which evolution throws on birds is that they do not in any way represent a past stage in man's evolutionary development, but have developed divergently along their own lines. Birds and mammals, in fact, represent two quite distinct branches of the tree of life, which developed quite independently from reptiles. And they developed from two quite distinct reptilian stocks, so that if we want to find a common ancestor for furry mammal and feathery bird, we must look for it in the most primitive kinds of reptiles, and must go back at least to the very beginning of the middle ages of life,

THE BIRDS' PLACE IN NATURE

about two hundred million years back. Their special resemblances, such as the uniform and high temperature, have been independently evolved in the two stocks, and in some cases, as with the division of the heart into two quite separate sides for more efficiency in circulation, though the result is the same, the evolutionary method followed has been dissimilar.

Birds have kept reptilian-looking scales on their feet, and have stuck to the reptile's method of reproduction by large-yolked eggs contained in a protective shell. In some ways, however, the bird branch has evolved beyond their rivals the mammals, and in these respects must be regarded as at the very tiptop of the tree of life. Birds have the highest temperature, and therefore the greatest speed of vital chemistry, of any creatures. They have the greatest activity, the greatest emotional variety; they show the highest extremes of beauty in colour and pattern; they have the most striking and highly developed courtship of any group of animals, and their songs are by far the most beautiful and elaborate music that the world knew before the coming of man. They are the most mobile of creatures, and so are at a great advantage over every other kind of land animal in high latitudes; for they can breed

THE BIRDS' PLACE IN NATURE

there and take advantage of the riches of the Arctic lands and still more of the Arctic seas during the summer, and then migrate to temperate climates, leaving a few wretched foxes and reindeer to eke out existence over the inhospitable winter.

There are two lines in which mammals have beaten the world—in brain-development and efficient methods of reproduction. As regards reproduction, it seems clear that the fact of flight discouraged any adoption of the perfected mammalian method of nourishing the unborn young within the mother's body. Extra weight is a severe handicap to a bird; and when it can mature and lay its eggs one at a time, and yet hatch them out all at once by putting off incubation until all are laid, it would be a disadvantage to handicap itself by the weight of half a dozen embryos at once. And it is perhaps just because of the bird's very success in the matter of flight and of high temperature that they failed to progress further in regard to brains. So many avenues were thrown open to them through their mobility and their activity that no pressure lay on them to circumvent fate by means of intelligence. Possibly too, their relatively small size had some say in the matter. Intelligence

THE BIRDS' PLACE IN NATURE

depends on making new combinations of nerve-paths in the higher centres of the brain; and for this a much larger number of nerve-cells and fibres seem to be required than for even the most elaborate equipment of the fixed nerve-routes by which instincts operate.

One thing at least is certain and significant; whereas in the general stock of mammals, progress was being made and new specialized lines budded out up till a mere five or ten million years ago, and in the line of man's descent evolutionary advance has continued up to the present and may well be prolonged into the future, the birds settled down to stability about half-way through the Tertiary Epoch, about twenty or thirty millions of years back, and since then, though they have doubtless sprouted out innumerable tiny side-twigs of new species and genera, do not seem to have made any real evolutionary progress.

Nor are they in the least likely to achieve any in the future. Like the insects, whose most advanced types such as the ants have been living the same kind of lives, endowed with the same kind of structure, for an even longer space of time, they appear to have reached the limit of perfection attainable, in the circumstances prevailing upon the earth, by the kind of creature

THE BIRDS' PLACE IN NATURE

which they are. They have attained the limiting speed of flight possible to living flying machines operating with feathers and one pair of wings; their temperature is as high as it can profitably be made; their migrations take them to the extreme of habitability in high latitudes; their ability in nest-building is as great as could be attained by instinct alone.

We must remember, however, that evolution is never all progress. Progress, it seems, there has always been, but it is progress in the upper limit of life's achievements, not in the great bulk of her productions. Indeed the impulsion to progress comes from the very fact that there already exists this great mass of animals and plants which have already reached a more or less final and stable relation with the world about them, and have already adequately filled the lower and more obvious places in life's economy. It is just because there exists such competition in the old ways of life that it is an advantage for any creature to push forward and adopt new and improved methods.

Each group that has reached stability is thus filling a very definite place in the elaborate system of exchanges which constitutes the balance of Nature. Looked at from this point of view, as

THE BIRDS' PLACE IN NATURE

regards what they do rather than how they do it, birds take on a new interest. The great majority of them are eaters of other animals, either throughout life, or in the case of small grain-eating birds like various finches, throughout their greedy nestling period. In this they have stuck to the ancestral predilections of vertebrates, which were all in origin flesh-eaters; a herbivorous diet only began late in vertebrate evolution, with some of the big reptiles, and later and still more efficiently with some of the bigger mammals. Among birds, on the other hand, very few are herbivorous; such are some of the geese and ducks.

The birds as a whole thus stuck to a meat diet; but their average size determined the average size of their prey. The great majority of them are so moderate in bulk that they can only eat small creatures; and these small creatures, though they will include worms and snails and spiders, will by the nature of the biological world be for the most part insects. Some of the larger birds eat creatures up to the scale of frogs and mice, or are carrion-feeders, or prey on other, smaller birds; and there are of course numerous water-birds which live on crustacea, the aquatic equivalent of insects, on molluscs,

THE BIRDS' PLACE IN NATURE

and on fish. But if we could take statistics of the food of all birds, in especial of all land birds, we should find that insects headed the list.

Now insects, in contradistinction to vertebrates, are in the great majority vegetable-feeders, both by ancestral predilection and modern practice. So that in regard to what we may call biological trade, the complicated circulation of matter through lifeless forms in earth, water and air, through green plants, animal bodies, and microscopic scavengers like moulds and bacteria, and back into lifeless forms again, the nett effect of birds is to be a check upon insects in their consumption of green plants and their products. In this way they are obviously the allies of man: remove every bird in the world at one stroke, the biological balance would be tilted, and it would be much harder even than now to protect man's crops and trees from the ravages of their persistent insect consumers. Birds in fact are one of the few groups of animals whose activities as a whole are useful to man.

But do not let us run away with the idea that economics are everything. There was a letter in *The Times* not long ago apropos of Sir Hilton Young's Bill for safeguarding some of the beauties of the countryside. The writer, after pointing

THE BIRDS' PLACE IN NATURE

out that the Bill, if it became law, would involve in certain cases some financial sacrifice for individuals or for the country, continued 'and after all, the aims of the measure are merely æsthetic'—and therefore in his estimation not to be weighed against even small quantities of £ s. d.

It is just this point of view—the attitude embodied in that word *merely*—which I want to combat. Economics is the foundation of everything, and money is money and must be made. We may know that elementary truth well enough, and yet be permitted the reminder that the really important thing is what we are going to ask of our money when we have made it. We may ask leisure, or a bigger house, or travel, or a gay life, or power, or bits of several in turn. And one thing that some will want to ask for is the refreshment of unspoilt country and the delight of wild birds. England is getting so crowded now, with mechanical devices so huge and pervading, and travel so easy, that the different things different people ask from money are coming to clash with each other. If the wants of different kinds of people are to be satisfied, there has got to be not only forbearance and good will but regulation and restriction.

The bird-watcher and the bird-lover ask for

THE BIRDS' PLACE IN NATURE

more birds, and more different kinds of them, and more opportunities of quietly watching and studying them. In the last thirty or forty years there has been a welcome change in the attitude of the general public about birds. They are more interested in them, fonder of them, delight to see photographs and read accounts of them in their wild state but deprecate the killing of them or the wanton taking of their eggs much more than they used to. The bird-watcher can help the growth of this changed attitude. We have gone a long way, but could go much further. In some American towns there are now bird-boxes everywhere in city parks and private gardens, and bird-tables and bird-baths—and naturally an enormous increase in the number of birds to gladden the eyes of city-dwellers. In Germany, before the war, I went once casually into the city park at Würzburg, and found an astounding plenty of birds, and people feeding them. One man had a couple of tits on his hand, chaffinches and blackbirds at his feet; he told me he once had a spotted woodpecker swoop down from a tree and take a nut from his fingers. And the hawfinches, those fantastic huge-billed birds, so shy that many country people do not know of their existence even where they are not

THE BIRDS' PLACE IN NATURE

uncommon—they were sitting about in the trees like sparrows; I even saw a pair of them courting over a public path and in full view and sound of the trams and traffic in the street beyond.

We could encourage and tame birds like this in our own garden and our cities and our parks if we wanted to.

The bird-lover can help to see that the Bird Protection laws are enforced; for in spite of the general change of attitude, there is still plenty of killing of rare birds and egg-snatching of rare eggs by people with the ridiculous collection-mania, plenty of snaring of linnets and goldfinches and other song-birds to be put into cages, plenty of wanton shooting, especially of something unusual just because it is unusual. .

He can try and get the law changed; to take an example, the law which permits the discharge of waste oil from oil-driven ships at sea, to drift about and foul our shores and in doing so to smear itself on the plumage of hundreds of guillemots and divers and puffins and other sea-birds, prevent them opening their wings, and so condemn them to death from starvation. If you want ocular demonstrations, go and look at the case in the Central Hall of the Natural History Museum at South Kensington which

THE BIRDS' PLACE IN NATURE

shows what happens to birds when the oily filth gets onto their feathers.

And he can help by supporting such bodies as the National Trust and the Royal Society for the Protection of Birds, which are saving wild bits of country from being built over or otherwise developed, or reserving them as actual sanctuaries, inviolate to the birds, or providing bird-rests at lighthouses to prevent dazzled migrants from being drowned, or paying watchers to see that protected birds are not shot or robbed of their eggs.

The nineteenth century robbed this country of many treasures of bird-life. There is, however, no reason why some of them at least should not be recovered for us and our descendants. The great bustard is perhaps an inevitable loss; but protection has brought the bittern back to breed and boom in Norfolk; the raven is here and there spreading back from the hill-fastnesses and cliff nesting-sites whither persecution drove it, down again to nest in trees in the lowlands.

The lovely black-and-white avocet, the fantastic ruff, the handsome godwit that once bred on many of our coasts before egg-stealers and even more the casual man with a gun drove them away, still nest abundantly just across the

THE BIRDS' PLACE IN NATURE

sea in Holland; and there is no reason at all why we should not lure them back again, and the black terns and strange great spoonbills too, if we set our mind to it.

For—and this is my last word—in considering the birds' place in Nature we must remember that they have a place in civilization as well as in wild nature, and that even if we be busy mechanizing so many aspects of life, or rather, just because we *are* mechanizing them, there is all the more reason to reserve to birds—shy birds as well as tame, rare birds as well as common—a place in our civilized scheme of things, and to see that that place is kept for them, and so for our delectation and that of our posterity.